TRANSPORTATION ON THE GREAT LAKES OF NORTH AMERICA.

MANY circumstances have recently directed the attention of the people to the transportation facilities of the Great Lakes. The rapid expansion of lake traffic, the increasing size of lake vessels and other developments of a similar character have interested the curious; while the vital significance of cheap carriage to the lumbering, mining and farming interests, has compelled the people engaged in these industries to give the various questions connected with lake shipping the most careful consideration. And the whole subject of inland waterways has been forced upon the attention of men in public life by the appeals that have been made to Congress for large appropriations for the immediate improvement of existing channels and the speedy construction of a deep waterway from the Great Lakes to the sea. Notwithstanding this widespread interest in the shipping of the lakes, and its far-reaching importance to several of our great national industries, the subject has been well-nigh neglected by writers on transportation.

The statistics of the commerce of the Great Lakes are not as comprehensive as might be desired and consequently it becomes somewhat more difficult to set forth its development. It was not until the year 1889 that statistics covering the movement of freight upon the whole lake system were collected.[1]

This deficiency is, however, in a very large measure made good by fairly complete information concerning the commerce passing through the St. Mary's Falls Canal[2] and the Detroit

[1] In 1852 a special report was submitted to Congress entitled *Andrew's Report on Colonial and Lake Trade* that covered the subject somewhat thoroughly, but the period considered antedates that of this paper.

[2] This gateway is commonly known as the "Soo" Canal.

River. From a statistical point of view these channels hold very important positions in lake transportation. All of the commerce going to and coming from Lake Superior passes through the St. Mary's Falls Canal, and fortunately we are in possession of very complete statistics of the traffic moved through it from the date of its opening in 1855. The other and much more important channel is the Detroit River, connecting lakes Erie and St. Clair. It is to be regretted that we do not possess equally satisfactory statistics of the commerce passing through this latter gateway. As the local traffic on the Great Lakes is comparatively insignificant, and as the long distance freight passes through one or both of these channels, the two sets of figures will provide a fairly accurate idea of the growth of the commerce upon the whole system and its various main divisions. For instance, if it were known how much east-bound freight had passed through the Detroit River in a year and it were also known how much freight had passed through St. Mary's Falls Canal eastward bound, we could determine approximately the amount of freight that originated in Lake Michigan ports; for the freight that originates in the ports of Lake Huron[1] is comparatively small in amount, and as its volume is definitely ascertained in the census years it could be estimated with considerable accuracy for the intervening years and proper deductions made.

The growth of the commerce of the Great Lakes as reflected by the increased amount of traffic passing through the Detroit River is disclosed by the following figures, which have for the most part been taken from the reports of Col. O. M. Poe, U. S. A., Corps of Engineers. The statement covers the traffic passing both up and down the river and is compiled from the returns of the custom houses.

[1] For the last census year 1889 the combined shipments from lakes St. Clair and Huron to all lake and St. Lawrence River ports amounted to but 2,344,451 tons.—*Eleventh Census, Transportation Business*, Part II, p. 309.

Year	Registered Tonnage	Freight Tonnage
1873[1]	.....	9,000,000
1880[2]	20,235,249	.....
1881	17,572,240	.....
1882	17,872,182	.....
1883	17,695,174	.....
1884	18,045,949	.....
1885	16,777,828	.....
1886	18,968.065	.....
1887	18,864,250	.....
1888	19,099,060	.....
1889	19,646,000	19,717,860[3]
1890	21,684,000	21,750,913
1891[4]	22,160,000	23,209,619
1892[5]	24,785,000	26,553,819
1893[6]	23,091,889	23,091,899
1894[7]	26,120,000	24,263,868
1895[8]	.....	29,000,000

Assuming now that these figures are correct, we find that although there has been a substantial increase in the amount of the traffic passing through this channel, yet the increase has not been sufficiently rapid to warrant the use of superlatives in

[1] *Brief of the Lake Carriers' Association, in Opposition to the Placing of Bridge Piers in the Detroit River*, p. 19. This document was prepared by Mr. C. H. Keep, who, for some years, has been secretary of the Lake Carriers' Association.

[2] *Report on the Internal Commerce of the United States for the Year 1891*, p. xxxix. The figures do not in any case include the tonnage of Canadian vessels, a large number of which use this channel. During the year 1890, according to the estimate submitted by Col. Poe, 3500 Canadian vessels, having an aggregate registered tonnage of 350,000 tons passed through the river. Neither is the tonnage of the vessels not clearing from a custom house included in the table. This class of vessels may, however, be ignored without materially affecting the correctness of the results. For the year 1890 Col. Poe estimated the cargoes of these vessels at 150,000 tons.

[3] For the freight tonnage of 1889 see *Eleventh Census, Transportation Business*, part ii, p. 275.

[4] *Annual Report of the Chief of Engineers*, 1892, p. 2482.

[5] *Ibid*, 1893, p. 3036.

[6] *Ibid*, 1894, p. 2378.

[7] *Ibid*, 1895, p. 3068. The freight tonnage for 1891–1894 includes only such staples as were shipped on vessels that cleared from some United States port.

[8] *Brief of the Lake Carriers' Association, in Opposition to the Placing of Bridge Piers in the Detroit River*, p. 15. The government engineer in charge of the river has not yet compiled his statements for 1895.

describing it, as has become the custom with writers upon lake transportation. Although the increase from 1873 to 1880 was rapid, yet during the decade ending with the year 1889 there seems to have been absolutely no increase in the commerce passing through this channel. This is made the more difficult of comprehension by the fact that there was a considerable increase of traffic upon the railroads of the country during this decade. From the year 1889 the gain has been substantial and bids fair to continue. The Canadian tonnage passing through this channel has not appreciably increased. It would seem therefore in the light of the figures given that it is hardly justifiable to apply such terms as "marvelous" and "phenomenal" to the growth of the traffic passing through the channel connecting lakes St. Clair and Erie.

Turning now from the Detroit River to the other statistical key, the St. Mary's Falls Canal, the table on the following page, taken from a report of General Superintendent Wheeler,[1] shows the growth of traffic upon the Lake Superior division of the lake system.

The very rapid increase in the tonnage passing through the St. Mary's Falls Canal is in striking contrast with the very slow increase of that passing through the Detroit River. The growth of the traffic through the former gateway has also been much more steady than the growth of the traffic through the latter. Since the year 1880, the volume of business passing through the St. Mary's Falls Canal has increased with surprising rapidity. This has been due for the most part to the astonishing development of the iron mines of the Lake Superior region during the last fifteen years. The amount of iron ore shipped from Lake Superior in 1880 was but 677,073 net tons. Since 1884, there has been a very rapid increase in the amount. For the season of 1895 the shipment of iron ore slightly exceeded 8,000,000 net tons and constituted a little more than one-half of the total movement of freight through the canal. Lumber, grain, flour, and coal are the other items which have made the largest contributions to the increased freight movement.

[1] Mr. Wheeler is the government engineer in charge of the canal.

Year[1]	Registered Tonnage	Total Freight, Net Tons[2]
1855	106,296	.....
1856	101,458	.....
1857	180,820	.....
1858	219,819	.....
1859	352,642	.....
1860	403,657	.....
1861	276,639	.....
1862	359,612	.....
1863	507,434	.....
1864	571,438	.....
1865	409,062	.....
1866	458,530	.....
1867	556,899	.....
1868	432,563	.....
1869	524,885	.....
1870	690,826	.....
1871	752,101	.....
1872	914,735	.....
1873	1,204,446	.....
1874	1,070,857	.....
1875	1,259,534	.....
1876	1,541,676	.....
1877	1,439,216	.....
1878	1,667,136	.....
1879	1,677,071	.....
1880	1,734,890	.....
1881	2,092,757	1,567,741
1882	2,468,088	2,029,521
1883	2,042,259	2,267,105
1884	2,997,837	2,874,557
1885	3,035,937	3,256,628
1886	4,219,397	4,527,759
1887	4,897,598	5,494,649
1888	5,130,659	6,411,423
1889	7,221,935	7,516,022
1890	8,454,435	9,041,213
1891	8,400,685	8,888,759
1892	10,647,203	11,214,333
1893	8,949,754	10,796,372
1894	13,110,366	13,195,860
1895	16,806,781	15,062,580

The facts have now been presented showing the development of the traffic through the St. Mary's Falls Canal and the Detroit River. In conclusion I shall present the facts we have in regard to the growth of business upon the whole system. The tenth census gives the amount of freight carried by steam vessels, but it was not until the eleventh census that the total volume of

[1] The canal was not opened until June 18, 1855.

[2] No record was kept until June 1881.

freight moved on all kinds of vessels was ascertained. The total amount of shipments from American ports for the last census year, or 1889, was 25,027,717 net tons. Col. Poe, in his reports to the Chief of Engineers, states that the registered tonnage that cleared from all the collection districts on the chain of the lakes for the year 1893 was 34,571,208 tons[1] and for the year 1894,[2] was 37,565,229 tons. As a rule the freight tonnage is in excess of the registered tonnage.[3] Assuming that the freight tonnage was just equal to the registered tonnage we have in the five-year period under consideration a gain in the freight movement on the whole lake system of 12,537,512 tons, which represents a gain of a trifle more than 50 per cent. In 1889 all the railroads in the United States carried 619,166,000 tons of freight[4]; in 1894, 675,129,747 tons. There was therefore in the five years a gain of 55,963,747 tons, a trifle more than 9 per cent. The comparison therefore is very favorable to the lakes.

Several striking facts concerning the character of lake transportation are brought out by the traffic statistics. Probably the first to arrest one's attention is its extreme simplicity; it is in the main made up of but very few commodities. The articles which constitute the great bulk — almost the whole — of the freight moved, are the crude products of the extractive industries. The mines, the grain fields and the forests of the territory about the Great Lakes are the sources in which the traffic originates. During the last census year the three commodities — coal, iron ore and lumber — contributed 75.73 per cent. of the total ton-

[1] *Report of the Secretary of War*, Vol. 2 (1894), part iv, p. 2378.

[2] *Annual Report of the Chief of Engineers* (1895), p. 3068. The figures for 1894 do not include Canadian tonnage; the report for the previous year leaves the point in doubt.

[3] The freight tonnage has been considerably in excess of the registered tonnage in case of the St. Mary's Falls Canal. Lieutenant J. B. Cavanaugh in a report to Brigadier-General William P. Craighill, Chief Engineer, says: "Since 1885 the freight tonnage has exceeded the registered tonnage on an average by about 8 per cent." Fifty-fourth Congress, first session, House of Representatives, *Document No. 110*. The figures covering the commerce of the Detroit River also show that the freight tonnage usually exceeds the registered tonnage.

[4] *Statistical Abstract* (1895), p. 325.

nage of the lakes; and grain and mill products contributed 16.15 of the remaining 24.27 per cent., thus leaving but 8.12 per cent. undistributed.[1] During the navigation season of 1895 there passed through the St. Mary's Falls Canal 15,062,580 net tons of freight. To this amount iron ore, coal, grain and flour, and lumber contributed 14,329,718 tons.

The traffic of the Detroit River presents the same simplicity as that of the St. Mary's Falls Canal. Several of the articles, however, which were rather insignificant among the commodities sent through the St. Mary's Falls Canal attain some little importance among the items of the freight passing through the Detroit River. During the navigation season of 1894, iron ore and finished iron, coal, grain and lumber (not including logs) contributed almost 20,500,000 tons to the 24,263,868 net tons of freight passing through the river. In order to more clearly set forth this simplicity I shall insert a detailed statement of the commerce passing through these two channels.

Statement of the freight traffic through the St. Mary's Falls Canal for the season of 1895[2]:

Items	Total traffic[3]
Coal:	
Hard (net tons)	440,477
Soft (net tons)	2,133,885
Flour (barrels)	8,902,302
Wheat (bushels)	46,218,250
Grain, excluding wheat (bushels)	8,328,694
Manufactured and pig iron (net tons)	100,337
Salt (barrels)	269,919
Copper (net tons)	107,452
Iron ore (net tons)	8,062,209
Lumber (M feet B. M.)	740,700
Silver ore (net tons)	100
Building stone (net tons)	23,876
Unclassified freight (net tons)	463,308

[1] *Eleventh Census, Transportation Business*, part ii. p. 308.

[2] The commerce passing through the Canadian canal is included.

[3] This statement was taken from the report to the Chief Engineer, U. S. A., made by Lieutenant J. B. Cavanaugh, Corps of Engineers, upon statistics of the commerce passing through St. Mary's Falls Canal during the season of 1895. See 54th Congress, first session, House of Representatives, *Document No. 110*.

Commerce of the Detroit River during the season of 1894, comprising staples only, and only such staples as were shipped on vessels that cleared from United States ports:[1]

Commodities	Amounts	Tons
Iron ore and finished iron	.....	6,448,445
Copper ore	.....	99,573
Silver ore	.....	412
Coal	.....	6,264,590
Building stone	.....	508,000
Cement (barrels)	917,265	114,000
Wheat (bushels)	57,337,278	1,749,600
Flour (barrels)	14,810,482	1,487,048
Corn (bushels)	46,394,308	1,800,000
Oats (bushels)	31,000,000	511,500
Rye, barley and malt (bushels)	1,556,000	38,700
Flax and grass seed (bushels)	555,968	33,000
Shingles and laths (pieces)	180,000,000	42,000
Telegraph poles (pieces)	109,000	30,000
Logs (ft. B. M.)	218,000,000	327,000
Lumber (ft. B. M.)	1,109,165,000	2,150,000
Provisions (hogshead)	341,000	560,000
Merchandise (packages)	5,450,000	2,100,000
Total	.....	24,263,868

The great preponderance of east-bound over west-bound freight is another of the conspicuous features of lake transportation. During 1890[2] the total east-bound traffic from United States ports amounted to 15,670,156 net tons.[3] Although the excess of east-bound over west-bound is very large in the case of the Detroit River it is still more characteristic of the traffic passing through the St. Mary's Falls Canal; moreover present indications go to show that the equilibrium will be still more disturbed, for the east-bound freight through the canal has recently been increasing at a more rapid rate than the west-bound. For the navigation season of 1895, the east-bound freight passing through the United States and Canadian canals at the outlet of Lake

[1] *Annual Report of the Chief of Engineers* (1895), p. 3068.

[2] This is the latest year for which we have official statistics that distinguish between east and west-bound traffic passing through the Detroit River.

[3] *Internal Commerce of the United States* (1891), p. xxxix. The limitations found in notes 2 and 7 on p. 334, apply here also.

Superior amounted to 12,029,657 net tons,[1] while the west-bound tonnage was but 3,032,923 net tons, or a little more than one-fourth that of the east bound. The difference in volume between the east and west-bound freight is not so great in the case of the business to and from Lake Michigan as it is in the case of the other lakes. The west-bound freight consists almost entirely of the one commodity — coal. In 1890 it constituted almost five-sixths of the west-bound traffic of the Detroit River, and during 1895 it formed somewhat more than five-sixths of the west-bound traffic through the St. Mary's Falls Canal. The great disparity which exists between east-bound and west-bound freight on the lake system as a whole is largely due to the fact that, as a nation, we ship by all routes much more freight to the east than we receive from the east. Inequality of east and west-bound shipments is not peculiar to lake transportation — it also characterizes railroad traffic. This disproportion is explained by the fact that in exchange for its heavy products of the mine, field and forest the west receives the manufactured products of the east and of foreign countries. The finished products received in exchange do not of course even remotely approach the crude products in weight and bulk.

The local freight business of the great lakes is very small; nearly the whole of the freight moved is carried from one end of the lake system to the other. About four-fifths of the iron ore mined in the Lake Superior region is carried to Lake Erie ports; nearly the whole of the grain and flour moved on Lake Superior is shipped from Duluth and West Superior, at the extreme western end of the lake, to Buffalo at the extreme western end of Lake Erie, or a distance of approximately 1000 statute miles; the bulk of the freight moved out of Lake Michigan originates in Chicago, at the extreme southern end of the lake, and is transported to Buffalo at the other end of the lake system. Lumber, the one large item remaining of the east-and south-bound freight, is also, for the most part, long-distance freight,

[1] These figures were taken from a statement kindly furnished me by General Superintendent Wheeler, the government officer in charge of the canal.

but its places of origin and destination are so numerous that this fact cannot be easily pointed out. The west-bound traffic, as has already been stated, consists almost entirely of the one article coal. It forms return cargoes for the vessels bringing iron ore, grain and flour from the head of Lake Superior and grain from the head of Lake Michigan to Lake Erie ports, and is, therefore, also long-distance freight.

The large items of lake commerce have now been considered and it has been found that in general they may be regarded as long-distance freight. This is equally true of most of the other items and of the package freight, but limitations of space forbid a detailed examination of the various items.

The reader will have observed the importance of the through traffic and the relative insignificance of the local traffic upon the great lakes. The shipments of iron ore from the Lake Superior region for the last census year (1889) amounted to 7,677,107 net tons, or a little less than one-third of the freight moved upon the whole chain of lakes during that year. Of this amount 6,490,518 tons, nearly six-sevenths, were received at Lake Erie ports. The total shipments of wheat, corn and other grain, amounted to 3,401,881 tons, and of this amount 3,008,901 tons were shipped from the ports of Lakes Michigan and Superior. The receipts at Lakes Erie and Ontario and at the St. Lawrence River ports aggregated 2,902,378 tons. The total shipments of mill products amounted to 894,123 tons, and of this amount 825,637 tons were shipped from the ports of Lakes Michigan and Superior. Lake Erie receipts amounted to 814,410 tons. The total movement of coal and coke was 6,105,799 tons. The shipments from Lake Erie ports aggregated 5,196,182 tons and the receipts at the ports of Lakes Michigan and Superior were 4,619,696 tons. General Superintendent Wheeler reports that the average distance which the 15,062,580 tons of freight, which passed through the St. Mary's Falls Canal in 1895, were carried, was 830 miles. And in a brief recently prepared by Mr. C. H. Keep for the Lake Carriers' Association, it is stated that the average length of haul for the 29,000,000 tons of freight which passed Detroit in 1895 was 750 miles.

Far reaching changes in the instrumentalities employed in the movement of lake commerce have lately taken place; not only has there been a very rapid increase in the size of the vessels but there has also been a revolution in the materials used in their construction and in the motive power employed. In 1870 the average size of the sailing vessels on the lakes was 156 tons; a decade later it had increased to 209 tons, and two decades later to 258 tons, while in 1895 the average tonnage of the sailing vessels was 273 tons. In the case of the steamers the increase in size has been even more rapid. In 1870 their tonnage was but 223 tons; during the next ten years it remained about stationary, being but 228 tons in 1880; the following decade, however, witnessed a very rapid increase, and the average measurement of the steamers that plied on the lakes in 1890 was 427 tons. There was still further progress during the succeeding five years, and in 1895 the average tonnage of the lake steamers had reached 489 tons or more than twice that in 1870.

Owing to the comparative absence from Lake Superior of small craft engaged in passenger and local freight business the average size of the vessels engaged in the heavy and long distance freight traffic of the lakes is much more accurately indicated by averages covering the vessels engaged in the commerce of this lake than by the figures which have just been presented. In 1870 the average registered tonnage of the various kinds of vessels passing through the St. Mary's Falls Canal was approximately 375 tons; in 1880 it was about 495, and by 1890 it had increased to about 800 tons. In 1895 it had much more than doubled as compared with 1870, and was very nearly 935 tons register.

The figures showing the progressive increase in the size of the vessels constituting the lake fleets have now been presented. These averages do not, however, convey an adequate idea of the change which has taken place, and for the obvious reason that because the life of a ship extends over a considerable period of time, the small vessels constructed in the earlier periods would still be in existence to depress the averages of the later

periods. To give the reader an accurate conception of the size and carrying capacity of the propellers which are now constructed I shall give the dimensions of "Coralia,"[1] a ship recently launched by the Globe Iron Works Company of Cleveland, Ohio. She measures 432 feet over all, and has a moulded depth of 28 feet, and a beam measurement of 48 feet. She will carry about 4100 gross tons on 14 feet 6 inches draft and over 6300 gross tons on 19 feet draft. She will not long be the only one of her kind, since two more vessels of like dimensions are building at the same yard. I shall compare the dimensions of this largest vessel on the lakes with those of two of the largest vessels on the ocean — the St. Louis and the St. Paul, which with the exception of the Campania and the Lucania are the largest steamships afloat.

It is thus seen that these ocean vessels surpass the largest vessels on the lakes in the matter of length by about 25 per cent., in breadth of beam by about 25 per cent., in depth by about 50 per cent. The great disparity in the matter of depth is explained by the shallowness of the water in the channels which connect the lakes.

The rapid substitution of steam for sails as a motive power is a conspicuous feature in the history of the lake fleet. In 1862[2] there were in the waters of the great lakes 350 steam vessels with a measurement of 125,620 tons, and 1152 sailing vessels with a measurement of 257,689 tons. The sailing ton-

[1] The dimensions of the Coralia were kindly furnished me by the secretary of the Globe Iron Works, Mr. Luther Allen; and those of the St. Louis were obtained from *Cramp's Shipyard*, p. 71, a volume recently published by Messrs. Cramp and Sons, the builders of the twin ships St. Louis and St. Paul.

	Coralia		St. Louis	
	Feet	Inches	Feet	Inches
Length over all	432	0	554	2
Length of keel	412	0	535	8
Extreme beam	48	0	62	9
Depth	28	0	42	4

[2] *Internal Commerce of the United States* (1891), p. x.

nage was thus a trifle more than double that of the steam tonnage. The relative importance of these two classes of vessels changed very slowly during the next twenty years, and it was not until 1884 that the steam tonnage exceeded the sail tonnage. Since 1884 the sailing tonnage has remained about stationary, being 307,933 tons in that year and 300,642 tons in 1895. The steam tonnage on the other hand has increased with great rapidity since 1884, and is now almost three times as great as the sailing tonnage. But even this ratio does not fully reflect the favor in which these two types of vessels are at the present time held, for the last two reports of the Commissioner of Navigation show that the steam tonnage constructed on the Great Lakes during the last two fiscal years was somewhat more than four and one-half times that of the sail tonnage.[1]

Circumstances decidely favor the substitution of steam for sails; steamers are operated on the Great Lakes under conditions the most favorable to steam navigation. Good steaming coal can be bought in the ports of the lakes at a very low price. And the voyages are very short in comparison with the long ocean voyages—a fact which makes it unnecessary to carry a great amount of dead freight in the form of coal. The comparatively limited extent of the lakes is favorable to steam navigation for another reason. In severe storms sailing vessels are helpless and drift with the wind; on the ocean this is not dangerous because there is sea room; but on the lakes vessels are soon driven ashore and wrecked. This danger is not so great in the case of steamers for they can run against the wind, and usually succeed in standing off from the shore. These facts together with the general desire of the modern business world for dispatch, sufficiently explain the change from sails to steam.

The increased size of the ships and the substitution of steam for sails—two of the three radical changes we have to consider,

[1] It is of course understood that the relative importance of these two classes of vessels as carriers does not vary directly with their tonnage; it is usually estimated that a steamer of a given tonnage is capable of performing about three times the work of a sailing vessel of the same capacity.

have rendered necessary, in order to secure strength, the third change, namely, the substitution of steel for wood as the material of construction. The preference for steel has become very decided in the last decade and now only those exceedingly conservative persons who never become adjusted to a new order of things persist in using wooden vessels. Lieut. Charles C. Rogers, U. S. N., in writing of the changes which have marked the construction of the lake fleets, says:[1] "The history of marine architecture does not furnish another instance of so rapid and complete a revolution in the material of floating equipment as has taken place on the Great Lakes since 1886." In 1886 there were but six steel vessels, with an aggregate net tonnage of 6459 tons, afloat on the lakes; but by 1890 the number had increased to sixty-eight with an aggregate net tonnage of 99,457 tons. Since 1890 the construction of steel vessels had gone on with even increased rapidity, and for the fiscal year 1895 steel was the material used in the construction of two-thirds of the tonnage built in that year.[2]

Not only has the steamer been crowding the sailing vessels out of business but it has also completely checked the increase of transportation by barges, that is the towing business. On June 30, 1870, there were 114 barges on the Great Lakes with an aggregate tonnage of 27,569 tons; during the next decade the number increased to 165 and the measurement to 40,965 tons. The high water mark was reached in 1883, when the aggregate tonnage stood at 43,374 tons. After 1883 there was a steady diminution of the barge tonnage, the low water mark being reached in 1889, when the total upon the lakes was but 7274 tons. Since 1889, there has been quite a rapid increase in this class of tonnage, and on June 30, 1895 it amounted to 39,008 tons, or about what it was in 1880, but still 3556 tons less than it was in 1883, the year of greatest barge tonnage. This rapid increase since 1889 might be regarded as an indication of the return of the

[1] *Eleventh Census, Transportation Business*, part ii, p. 268.

[2] *Report of the Commissioner of Navigation* (1895), pp. 353 and 334.

barge.[1] A full knowledge of the situation, however, would prevent such an inference being drawn. Nearly the whole of this increased tonnage was constructed as an experiment by the American Steel Barge Company of West Superior, Wisconsin, and is of the "whaleback" type.

On our other great inland waterway—the Mississippi River and its tributaries—the barge has been decidedly growing in favor during the past twelve or fifteen years. In 1880 there were 1198 steamers registered in the ports of the Mississippi valley, with an aggregate tonnage of 251,793 tons, while ten years later the registered steamers numbered but 1114, with a measurement of 210,772 tons. The decade thus presents an absolute decrease of 84 in the number of steamers and of 41,021 tonnage tons. The figures covering the unrigged craft are in striking contrast with those just presented. In 1880 the barges numbered 3854 with an aggregate tonnage of 909,824 tons, but during the next decade there was a rapid increase of this kind of craft, and in 1889 there were 6339 barges on the river and its tributaries with an aggregate tonnage of 3,183,608 tons. The decade thus shows an absolute increase of 2485 in numbers, with an increased measurement of 2,272,784 tons.[2]

The explanation of this diversity of tendencies on the rivers and on the lakes is not far to seek. The shallow water of the Mississippi and its tributaries compels the use of a vessel drawing but little water, and such a craft is the river barge. On the lower Mississippi, where the water is deeper, the use of the barge is not so advantageous and the steamer has here held its own.

[1] The secretary of the Lake Carriers' Association, Mr. C. H. Keep, seems to be of the opinion that the barge is not to disappear, for in a brief which he has recently prepared in opposition to placing bridge piers in the Detroit River, he says: "It should be noted that the system of towing is growing in favor. Besides long tows of several vessels there is now and will be seen upon the lakes a constantly increasing number of steamers over 400 feet long, each towing a consort herself over 400 feet long."—*Brief of the Lake Carriers' Association*, p. 26. Mr. Keep is of course in an excellent position to know the trend of affairs and in general therefore I should not oppose my opinion to his, but in this particular case he appears as an advocate and his judgment may be somewhat influenced by his position.

[2] *Eleventh Census, Transportation Business*, part ii, p. 448.

Because of the betterment of tracks, and the use of improved facilities for handling freight at terminals, but especially on account of the introduction of more efficient instruments of transportation, our railroads have in late years found it possible to lower their freight tariffs. Similar changes have been in progress in the lake transportation business, and there, also, have made possible a reduction of charges. Better road beds, heavier rails, straighter tracks with smaller grades, find their counterpart on the lakes in deeper and more direct channels, and in more effective locks; the improvements which the railroads have introduced for the expeditious handling of freight at terminals have been more than equaled by the dock and steamship companies; and the rapidity with which cargo freight is now loaded and unloaded approaches the marvelous. Better tracks have made it possible to run heavier trains, and similarly, deeper channels have enabled the vessel men to increase the burden of their ships. We have now seen that the improvements which have rendered possible a reduction of carrying charges on the railroads have also made possible a reduction of tariffs on the lakes.

I shall now endeavor to show to what extent rates have actually fallen. First let us compare the rates prevailing in one period with those of other periods in order to determine the absolute decline. In attempting to do this we are at the outset confronted with a serious problem, namely, as to the period which shall be selected as a starting point, and what other periods shall be contrasted with the one first selected. This question is always a perplexing one, but in the case in hand it is unusually difficult because of the violent fluctuations that characterize lake rates from year to year. To avoid the necessity of selecting a starting point, and also the more clearly to portray the movement of charges, I have charted the charges for a very long period. The article selected is wheat, and the rates are those between Chicago and Buffalo as given by the New York Produce Exchange. The charges for this one commodity alone were charted because wheat is a representative freight and fairly

reflects the general movement of rates.[1] Although there has been a considerable reduction in rates over the whole period, the fall since the early eighties has not been great, and one searches the chart in vain for the rapid decline suggested by the following quotation[2]: "In 1859 the average rate of freight by lake on a bushel of corn from Chicago to Buffalo was 15¾ cents per bushel. In 1871 the rate was 7½ cents per bushel, and in 1890 1.9 cents per bushel." This rapid decline cannot be found upon the chart, and for the simple reason that it never occurred. The rate upon corn from Chicago to Buffalo for 1859 as given by the New York Produce Exchange[3] was 4.6 cents instead of 15¾ cents as given above.[4]

The average rate on corn from Chicago to Buffalo according to the report of the Chicago Board of Trade for 1859 was 4.51 cents.[5] The reports[6] of the same organization give 15.7 cents as the rate for 1859 on corn from Chicago to New York City. It will be noted that this rate to New York City is just about the same as that to Buffalo as given in the quotation. The rates to Buffalo and to New York City were evidently confused, and the form of the tables in the report from which this quotation was taken lends force to this inference. Now, with this correction, if we compare the rate for 1871, namely, 7.5 cents, with the rate for 1859, 4.6 cents, it is found that the rates actually increased 2.9 cents during this interval of twelve years.[7]

Rates have sometimes been so selected as to give one the impression that charges have fallen rapidly and continuously.

[1] Rates on iron ore from Marquette on Lake Superior to Lake Erie ports will be found in the appendix.

[2] *Internal Commerce of the United States* (1891), p. xliii.

[3] *New York Produce Exchange* (1872–3), p. 400.

[4] This error is repeated by Henry C. Adams (see *Eleventh Census, Transportation Business*, part ii, p. 284); as also by Mr. C. H. Keep, Secretary of the Lake Carriers' Association (see *Internal Commerce Report of the United States*, 1891, Appendix, p. 58).

[5] *Report of the Chicago Board of Trade* (1893), p. 76.

[6] *Ibid.* p. 115.

[7] So much space would not have been given to this error but for the fact that it has been widely quoted and has been productive of much misunderstanding.

The following is an example in point:[1] In 1857 the average rate by lake and canal on a bushel of wheat from Chicago to New York was 25.29 cents. In 1890 the rate for the same service was 17.1 cents per bushel, and in 1890, 5.85 per bushel. Now note what a change is introduced by selecting the rates prevailing in 1858 instead of 1857, and in 1871 instead of 1870:[2]

Years	Rates (cents)	Years	Rates (cents)
1857	25.29	1858	16.28
1870	17.10	1871	20.24
1880	12.27	1880	12.27
1890	5.85	1890	5.85

These examples show how important it is, if it be desired to communicate a correct impression of the movement of rates, that the greatest circumspection be exercised in the selection of the points of the movement which are to be compared, and particularly in the choice of the initial point.

Another method of presenting lake freight rates in a very favorable light is by contrasting them with rail rates, which is usually done in the following manner: The average charge on all the railroads in the United States for hauling one ton one mile for some year is compared with the average amount exacted for similar service on the lakes. Obviously this sort of a procedure is unfair to the railways, for the service they perform differs from that rendered by the lake carriers. The railroad tonnage is largely made up of local freight, while the freight tonnage of the lakes is through traffic, and is composed of but few commodities, all of which are handled in large quantities. This characteristic of lake commerce is of the greatest moment, for it makes specialization in the shipping business possible, and assures a full cargo of one article at one port. It is needless to say that rates on the lakes would not be as low as they are if it were necessary to so construct vessels as to enable them to carry

[1] *Internal Commerce of the United States* (1891), p. xliii.

[2] The figures substituted were taken from the *Statistical Abstract of the United States* (1895), p. 330.

a variety of commodities and if they were compelled to go to a number of ports to collect the cargo; and then too, it is to be remembered that the lake hauls are usually very long ones—a fact that has a most important bearing on rates.

Another way of showing the relative cost to the public of the lake and rail service that is often resorted to, is the comparison of the lake and rail rates on some commodity which is transported in large quantities, and for long distances by both carriers. Wheat and corn are such commodities. Have we here the proper conditions for a comparison? Clearly the circumstances are much nearer what they should be than they were in the case of the comparison of ton mile charges, but even in this instance the conditions are not exactly fair. Allowance ought to be made for the fact that the national government not only provides the lake carriers with channels and harbors free of charge but also maintains them in good condition without compensation. In addition there are minor factors that favorably affect the cost of the service rendered by the lake carriers; such as the liberality displayed toward the shipping interest by some of our state legislatures in the matter of taxation,[1] and the fact that the railroads continue their service during the winter when the cost of service is manifestly much greater than during the summer. Thus it must be granted that even in the case of comparison of the lake and rail rates for some commodity which is transported in large quantities and for long distances by both carriers, we have not found a fair basis upon which the freight charges of the two transportation agencies can be contrasted, because the community as a whole comes to the assistance of the lake carriers, and because the service is rendered by one of the carriers at all times and by the other only at certain seasons under favorable circumstances. Then, too, it must be remembered that in the transportation of such commodities as iron ore, coal, grain and

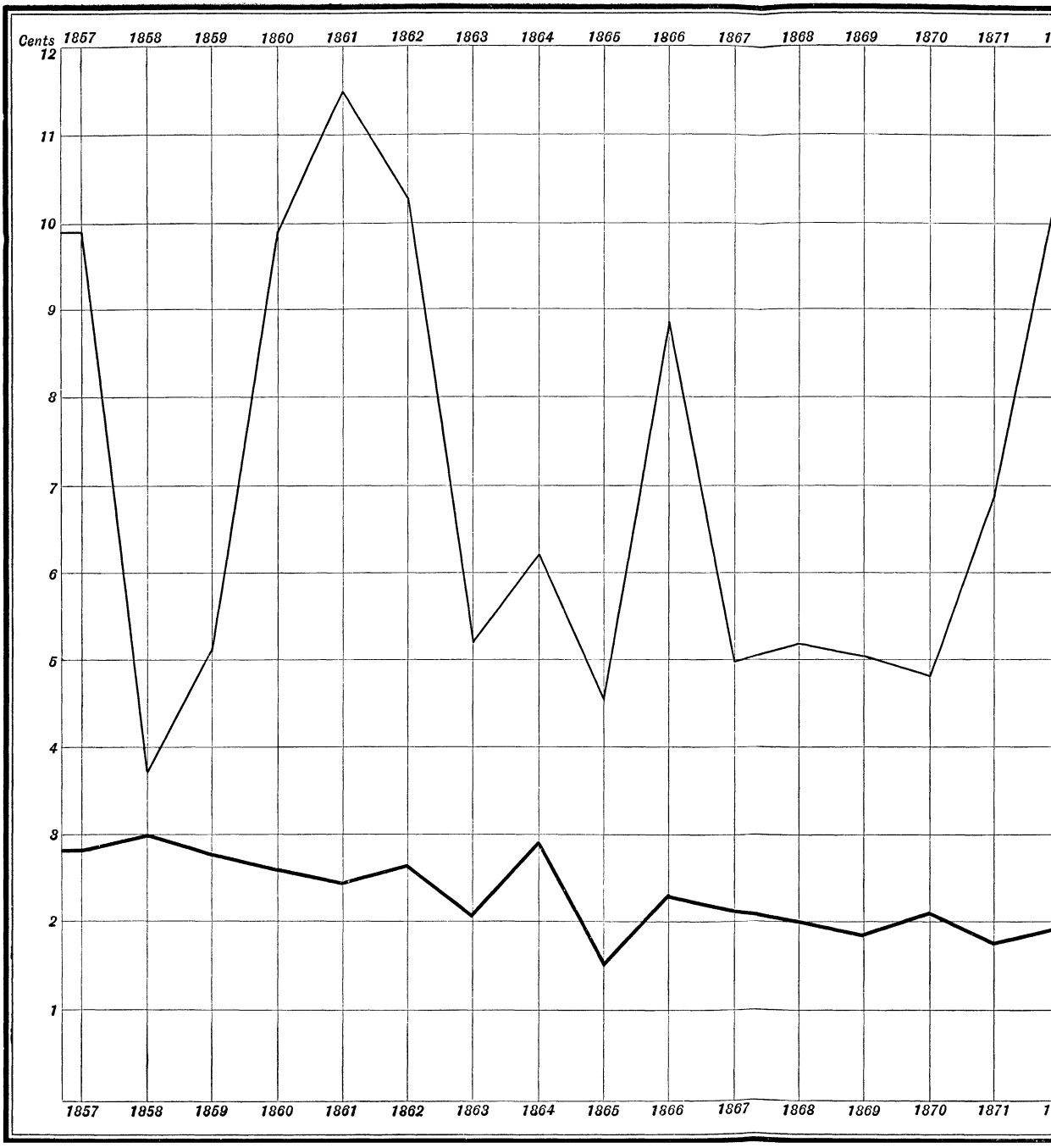
[1] Minnesota is a good example; by an act recently passed its shipping on the Great Lakes is practically exempt from taxation. Vessels pay a state tax of but 3 cents per net ton and are entirely exempt from municipal taxation.—*Report of Commissioner of Navigation* (1895), p. 202.

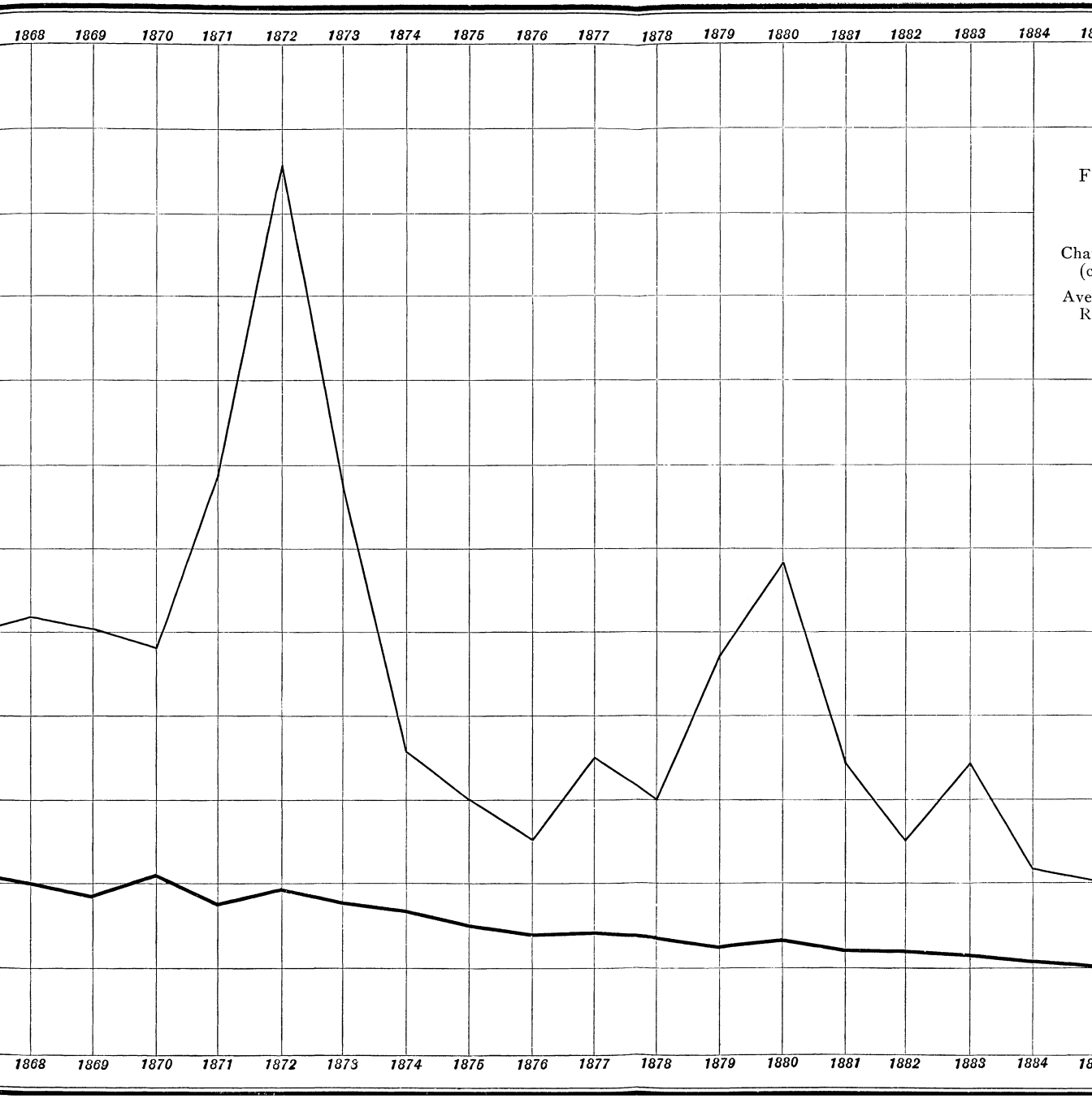
lumber, the lake carriers are operating with commodities which their equipment enables them to handle to best advantage. If the cost of service to the shippers on all kinds of freight were to be inferred from the rates on local freight, the comparison would not issue so favorably to the lake carriers.

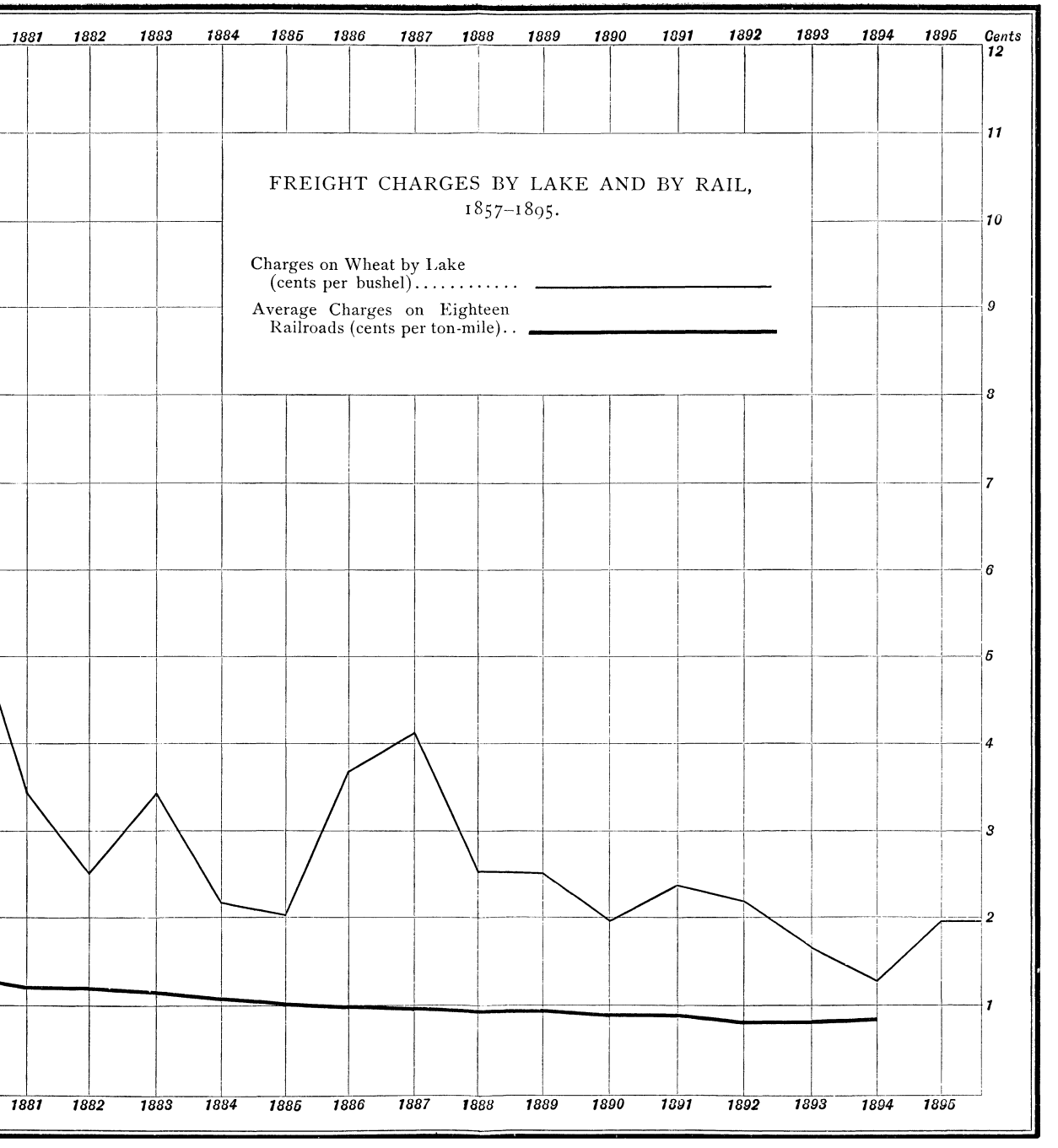
Before leaving the question of rates, rail and lake charges may be contrasted. The average amount charged by eighteen trunk lines for carrying one ton one mile, and the rates on wheat by lake from Chicago to Buffalo, have been selected for this purpose. To enable the reader to readily comprehend the movements the rates have been charted. The exceedingly violent fluctuations of the lake rates stand in striking contrast with the steady movement of the rail charges. The very erratic movement of the former is explained by the method of fixing rates by the lake carriers, who introduce an entirely new schedule at the opening of each season of navigation. If business promises to be heavy, rates are fixed very high while if the business outlook be gloomy they drop very low. These violent fluctuations serve to show the flexibility of the lake charges — the ease with which the rates are adjusted to what the traffic will bear.

GEORGE TUNELL.

UNIVERSITY OF CHICAGO.


Cents
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
12
11
10
9
8
7
6
5
4
3
2
1


1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
F
Cha
(c
Ave
R


1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895
Cents
12
11
10
9
8
7
6
5
4
3
2
1
FREIGHT CHARGES BY LAKE AND BY RAIL,
1857–1895.
Charges on Wheat by Lake (cents per bushel).....
Average Charges on Eighteen Railroads (cents per ton-mile)..